Advanced Control Theory for Wave Energy Utilization

When working with optimization of the power performance of a wave energy device, the control hereof, via the power take-off system is of paramount importance. This course will focus on this issue, and go through the basics of control of wave energy devices (based on wave activated bodies) and work its way through to stochastic optimal control of ditto.

The topics will include:
- Optimal control of wave energy devices
- Basic mechanics of wave energy devices with power output control.
- Optimal control for linear and nonlinear systems. Linear quadratic control.
- Control using noise free observers.
- Stochastic optimal control of wave energy devices.

Registration deadline: September 21, 2012

Reliability and Risk Analysis of Wind Turbines and Wave Energy Devices

Reliability is a very important issue for both wind turbines and wind energy devices. Reliability is important both for estimating failure rates and probabilities for different components and members in structures, and for planning optimal operation and maintenance. In traditional deterministic code-based design the structural costs are influenced by the value of the safety factors. These reflect the uncertainty related to the design parameters. Improved design with a consistent reliability level for all components can be obtained by use of probabilistic reliability-based design methods, where explicit account of uncertainties related to loads, material strength, and calculation methods is made.

The course will include the following topics:
- Introduction to risk and reliability analysis
- Stochastic modelling of uncertainties and failure rates, incl. Bayesian techniques
- Reliability analysis of electrical and mechanical components
- Reliability analysis of structural members by FORM/SORM and simulation methods
- Reliability assessment using theoretical models in combination with information from tests
- Methods for reliability analysis of wind turbines
- Methods for reliability analysis of wave energy devices

Prerequisites: Basic knowledge on probability theory and statistics.

Registration deadline: November 9, 2012
PhD courses in Wave Energy

In Autumn 2012 the Wave Energy Research Group at Aalborg University, Department of Civil Engineering offers four Ph.D. courses related to the utilization of wave energy.

The courses are arranged through the Doctoral School of Engineering and Science at Aalborg University.

For Ph.D. students registered at any university, participation in the course itself is free. However, a fee will be charged to cover expenses for lunches, coffee, transportation, etc.

For non-Ph.D. students, an additional registration fee (stated below for each individual course) will also be charged. The fees will be charged after the registration deadline is passed and registrants have got the confirmation of participation.

COURSE 1 (5 ECTS)  September 24-28, 2012
Generation and Analysis of Waves in Physical Models

The objective of the course is to train students in advanced methods and techniques in generation and analysis of waves in physical models in order to know their advantages and limitations.

The course will cover analysis of long and short-crested waves, generation of linear and non-linear regular waves, generation of long and short crested irregular waves, active absorption in flumes and basins, wave groups, bounded long waves and wave generator choice and design.

Prerequisites: Basic fluid and wave mechanics

Registration deadline: August 15, 2012

COURSE 2 (3 ECTS)  November 19-23, 2012
Experimental Testing for Wave Energy Utilization

The work on development of devices for utilization of wave energy typically involves intensive laboratory model testing in wave tanks and/or flumes at the earlier stages, and intensive testing and monitoring of device prototypes in real seas at later stages. At prototype scale the testing typical also includes testing and developing the control algorithms for the device.

The objective of this course is to introduce and apply wave analysis theory, laboratory measuring techniques, prototype monitoring and control. The course will include class room lectures, laboratory exercises in the wave tanks/flumes and analysis of prototype data from real sea testing.

The course will include the following subjects:

- Time and frequency domain wave analysis
- Reflection wave analysis
- 3-D wave analysis
- Laboratory and prototype measuring techniques for waves, loadings and power take-off
- Analysis of real sea data
- Probabilistic design of wave energy devices
- Numerical modelling of waves and wave energy devices

Registration deadline: September 21, 2012

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INFORMATION
Jens Peter Kofoed (jpk@civil.aau.dk)

REGISTRATION
phdcourse.aau.dk > Civil Engineering

NOTE:
Registration via the above-mentioned website will not be possible until 3 months prior to the specific course.

If you want to secure a seat at any of the courses earlier than that, please write vs@civil.aau.dk.